PT90 A
CHASSIS SERVICE MANUAL

Modification reserved

CONTENTS

		PAGE
1.Technical Data		4
2. Recommendation for service repairs		5
3. Service Menu		6
4. Specification of the connector (Euroscart)		8
5. Component descriptions		9
6. Introduction		10
7. Block Diagrams		11
8. Fault tracing diagram-power supply		14
9. Troubleshooting guide for main PCB		15
10. Descriptions of the integrated circuits		
- ST921x5	*MICROCONTROLLER*	17
- 24C08	*NON-VOLATILE MEMORY*	22
- STV224X	*MULTISTANDARD TV PROCESSOR*	23
- MSP34XX (D/G)	*MULTISTANDARD SOUND PROCESSOR*	28
- TDA7495	*11+11W AMPLIFIER WITH DC VOLUME CONTROL*	30
- TDA7496	*5+5W AMPLIFIER WITH DC VOLUME CONTROL*	33
- TDA7494	*10W AMPLIFIER WITH DC VOLUME CONTROL*	36
- STV5112	*RGB HIGH VOLTAGE VIDEO AMP.*	39
- TDA1771	*VERTICAL DEFLECTION CIRCUIT*	42
- STV9306	*BUS CONTROLLED VERTICAL DEFLECTION SYSTEM*	45
- TDA16846	*CONTROLLER FOR SWITCH MODE*	48
- TCDT1100(G)	*OPTOCOUPLER*	51
- TL431	*PROGRAMMABLE VOLTAGE REFERENCE*	54
- SPP03N60S5	*COOL MOS POWER TRANSISTOR*	56
- SPP04N60S5	*COOL MOS POWER TRANSISTOR*	59
- L7805	*POSITIVE VOLTAGE REGULATORS*	62
- LM317	*1.2V TO 37V VOLTAGE REGULATOR*	64
- BU508DF	*HORIZONTAL TRANSISTOR (90°)*	66
- BU508AF	*HORIZONTAL TRANSISTOR (110°)*	68
11. Chassis replacement part list		71

TECHNICAL DATA

CRT PANEL	
Visible Picture	20″ / 21″ / 28″
Deflection Angle	90° / 110°
Vertical Frequency	50Hz
Horizontal Frequency	15.625Hz

ELECTRONIC

Program Number	100+AV
Teletext	Flof text
Tuner	Cable tuner - 8 MHz spacing for Hyper Band
TV System	European CCIR system
Music Power	90° 2x4 Watt, 110° 2x8 Watt, Rms 10% distortion

CONNECTIONS

Euro AV Socket	Include

MAIN STAGE

Mains Voltage	165-260VAC
Mains Frequency	50Hz
Power Consumption	20″, 21″ 75 Watt, 28″ 126 Watt
In Stby Mode	20″, 21″ 7 Watt, 28″ 8 Watt

RECOMMENDATION FOR SERVICE REPAIRS

1- Use only original spare parts. Only use components with the same specifications for replacement.
2- Original fuse value only should be used.
3- Main leads and connecting leads should be checked for external damage before connection.
Check the insulation.
4- Parts contributing to the safety of the product must not be damaged or obviously unsuitable.
This is valid especially for insulators and insulating parts.
5- Thermally loaded solder pads are to be sucked off and re-soldered.
6- Ensure that the ventilation slots are not obstructed.
7- Potentials as high as 25 KV are present when this receiver is operating. Operation of the receiver outside the cabinet or with back cover removed involve a shock hazard from the receiver.
Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high voltage equipment
Perfectly discharge the high potential of the picture tube before handling the tube. The picture tube is highly evacuated and if broken.
Glass fragments will be violently expelled.
Always discharge the picture tube anode to the receiver chassis to keep of the shock hazard before removing the anode cap.
8- Keep wire away from the high voltage or high temperature components.
9- When replacing a wattage resistor in circuit board keep the resistor 10 mm away from circuit board.

HANDLING OF MOS CHIP COMPONENTS

MOS circuit requires special attention with regard to static charges. Static charges may occur with any highly insulating plastics and can be transferred to persons wearing clothes and shoes made of synthetic materials. Protective circuits on the inputs and outputs of mos circuits give protection to a limited extend only due to time of reaction.

Please observe the following instructions to protect the components against damage from static charges.

1- Keep mos components in conductive package until they are used. Most components must never be stored in styropor materials or plastic magazines.
2- Persons have to rid themselves of electrostatic charges by touching MOS components.
3- Hold the component by the body touching the terminals.
4- Use only grounded instruments for testing and processing purposes.
5- Remove or connect MOS ICs when operating voltage is disconnected.

X-RAY RADIATION PRECAUTION

1- Excessive high voltage can be produce potentially hazardous X-RAY radiation. To avoid such hazard, the high voltage must not be above the specified limit. The nominal value of the high voltage of this receiver is 25KV at zero beam current (minimum brightness) under 220V AC power source. The high voltage must not under any circumstance, exceed 30KV. It is recommended the reading of the high voltage be recorded as a part of the service record. It is important to use an accurate and reliable high voltage meter.
2- The primary source of X-RAY radiation in this TV receiver is the picture tube. For continued X-RAY radiation protection, the replacement tube must be exactly the same type tube as specified in the part list.

SERVICE MENU

The service menu is entered by pressing a special 4-digit code if the feature menu is displayed and TV is in FE-mode. While TV isn't in AV Mode and fetura menu is displayed, pressing sequence of digits 1923 will enter the TV to service mode and service menu will be displayed.

OPTIONS

Option Byte 1: 76543210

B0 1: B/G Standard available 0: Not available

B1 1. DK Standard available 0: Not available

B2 1. I Standard available 0: Not available

B3 1: L Standard available 0: Not availabie

B5-4 TTX National Character Set Group

00 - Set1	ENGLISH, GERMAN, SWEDISH, ITALIAN, FRENCH, SPANISH, CZEKOSLOVAKIAN, RUMANIAN
01 - Set 2	POLISH, GERMAN, SWEDISH, ITALIAN,FRENCH, SERBO-CROATIAN, CZEKOSLOVAKIAN, RUMANIAN
1X - Set 3	ENGLISH, GERMAN, SWEDISH, ITALIAN, FRENCH, SPANISH, TURKISH, RUMANIAN

B7-6 Tuner Type

00 : Alps

01 : Temic

10 : Philips UV1316

11 : Thomson/Orega

Option Byte 2: 76543210

B0:	AV-2 1 : AV-2 available	0: AV-2 Not Available
B1:	VHS 1 : SVHS available	0: SVHS Not Available
B2:	TR 1 : Turkish language available	0: Turkish Language not available
B3:	ES 1 : Ecoswitch available	0: Ecoswitch not available
B4:	CL 1 : Child Lock available	0: Child Lock not available
B5:	HP 1 : Headphone available	0: Headphone not available
B6:	SW 0 : Subwoofer available	1: Subwoofer not available
B7	PT 1 : 4/3 Picture tube	0: 16/9 Picture tube

Options B4-7 are only relevant if the corresponding modules are present in the software

Option Byte 3: 76543210

B0:	CR 1. : One Crystal application	0: Two Crystal application (for NTSC playback)
B1:	SS 1. : Intercarrier application	0: QSS application
B2:	APR 1 : APR ON	0: APR OFF
B3:	OSD 1 : OSD contrast control ON	0: OSD contrast control OFF
B4:	BS 1 : Blue screen disabled	0: Blue screen enabled
B5:	AVL 1 : AVL ON	0: AVL OFF
B6:	CLP 1 : Clipping Mode: compromise	0: reduce tone (MSP)
B7:	STB 1 : Stanby after power on	0: No standby after power on

GEOMETRY... (90 deg Chasis)

V.SIZE 4/3 50Hz
V.SIZE 16/9 50Hz
V.SIZE 4/3 60 Hz
V.SIZE 16/9 60 Hz
V. POS
H.POS

GEOMETRY... (110 deg Chasis with STV9306 IC)

V.SIZE
V.POS
V.C.CORR
V.S.CORR
H.SIZE
H. PINC.CORR
H. KEYS.CORR
H.COR.CORR
H. POS

VIDEO...

R GAIN
G GAIN
B GAIN
R CUTOFF
G CUTOFF

TUNER/IF...

AGC
PIF COARSE
PIF FINE
PIF C OARSE L'
PIF FINE L'

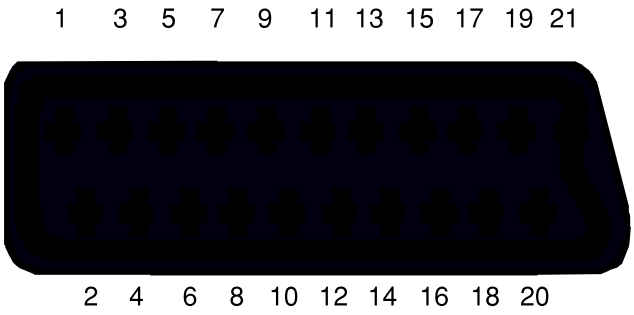
> : < is the VCO status indicator for adjusing the PIF to 38.9Mhz for BGDKIL and 33.9 for L' standards thru bus controlled VCO.

The VCO status is read from the read register of STV224X and guides whether to Increase / Decrease the VCO registers to attain VCO OK Status. I For doing VCO adjustment, Feed a 38.9MHz Carrier as IF input and adjust PIF Coarse and fine parameters to get VCO OK Status.

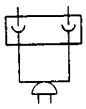
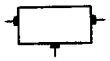
For doing VCO L1 adjustment, Feed a 33.9 MHz carrier as IF input and adjust PIF Coarse L' and PIF Fine L' to get VCO OK Status.

SPECIFICATIONS OF THE CONNECTOR
(EURO SCART)

I- Audio output 1. right channel 0.5 VRMS/<I k 0
2- Audio input 1. right channel 0.5 VRMS (connected to No.6)
3- Audio output 2. left channel 0.5 VRMS (connected to No.1)
4- GND (audio)
5- GND
6- Audio input 2. left channel 0.5 VRMS/>10k 0
7- RGB input, blue (B)
8- Switch signal video (status)
9- GND
10- Reserved for clock signals (not connected)
11- RGB input, green (G)
12- Reserved for remote control (not connected)
13- GND
14- GND switch signal RGB
15- RGB input, red (R)
16- Switch signal RGB
17- GND (video)
18- GND19- Video output 1 Vpp/75 ohm
20- Video input 1 Vpp/75 ohm
21- Shield



COMPONENT DESCRIPTIONS

	POWER CORD
	SAW FILTER
	IR SENSOR
	VOLTAGE REGULATOR
	ON/OFF SWITCH
	LINE FILTER
	PTC
	NPN TRANSISTOR
	PNP TRANSISTOR
	CERAMIC FILTER
	COIL
	LINEARITY COIL
	FUSIBLE RESISTOR
	IW METAL OXIDE RESISTOR
	1/2W METAL OXIDE RESISTOR
	1/4 OR 1/6W CARBON FILM RESISTOR
	CERAMIC CAPACITOR /POLYESTER CAPACITOR
	ELECTROLYTIC CAPACITOR
	DIODE
	ZENER DIODE
	SWITCH JUMPER
	NET (INPUT)
	NET (OUTPUT)
	TACT SWITCH

INTRODUCTION

PT90A is a low-cost multi-standard television receiver control system based on ST921x5 microcontroller family. It is a frequency synthesis tuning (FST) system with on-screen display (OSD) for all necessary control functions. The system is based on the I²C-bus controlled one-chip video processor IC STV224x, which can support a Nicam and a German stereo sound system based on MSP as well as mono sound.
PT90A has the ability to control two scart connections, and headphone inputs.
Teletext is handled by the microcontroller on-chip teletext interface. The user-interface is menu-controlled for easy access with remote control or local keyboard keys.

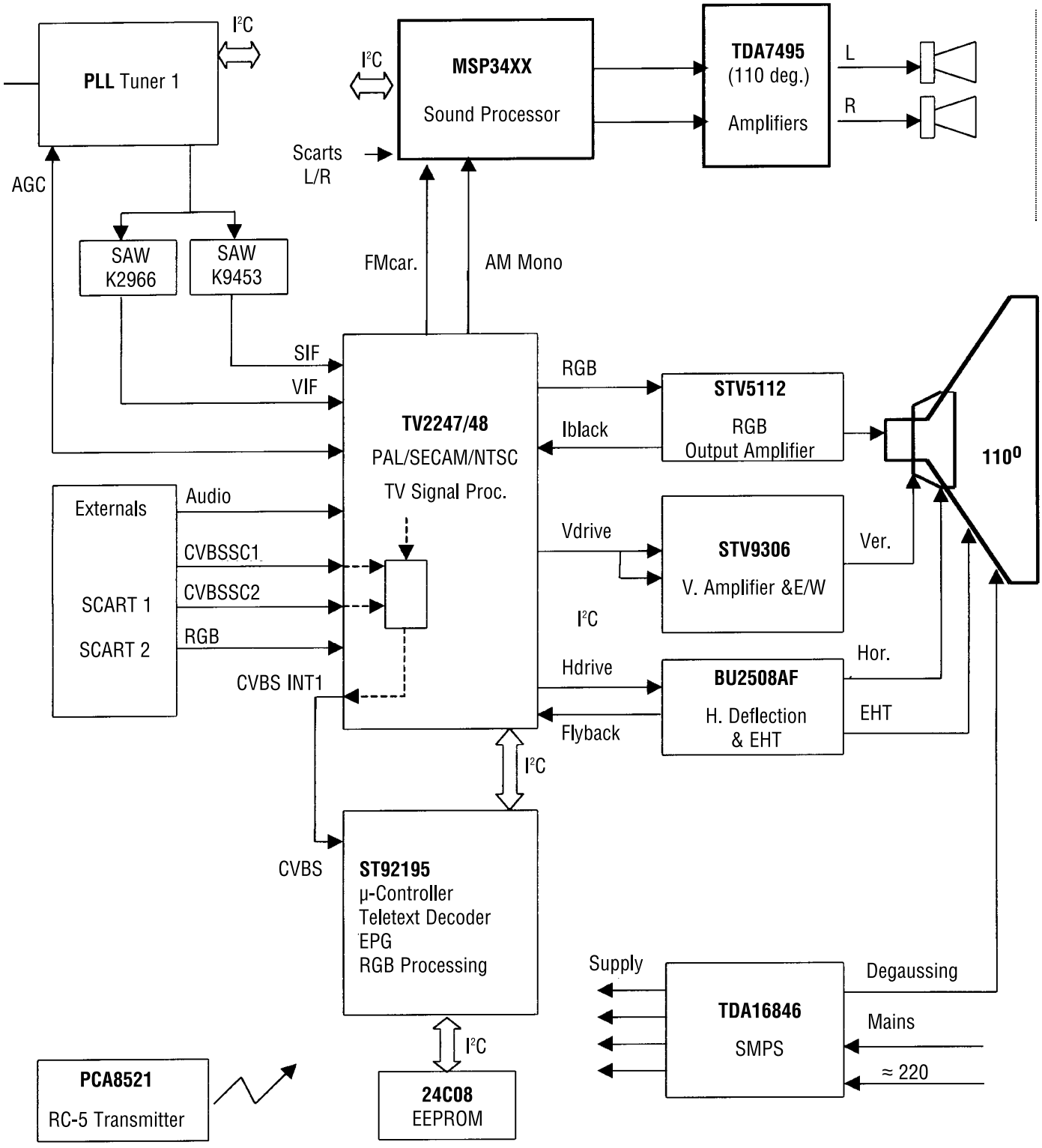
1.1 Definitions, acronyms and abbreviations.

- ADC Analogue to Digital Converter
- AFC Automatic Frequency Control
- AV Audio Video peripheral TV signal source
- DAC Digital to Analogue Converter
- FE Front End(=normai TV) mode
- FST (PLL) Frequency synthesis Tuning (Phase Locked Loop)
- I²C Inter Ic bus, 2-wire, bidirectional multimaster bus
- IDENT Horizontal coincidence signal, transmitter IDENTification
- LS Loud Speaker
- HP Headphone
- MS Multi Standard
- NV-Memory Non-Volatile Memory
- OSD On Screen Display
- PP Personal Preference
- RC-5 Remote Control System, complying with RC-5 world standard
- Video Proc. STV223x, integrated I²C bus controlled multisystem one chip TV-processor
- PIF Picture Intermediate Frequency.
- SIF Sound Intermediate Frequency.
- NICAM Near Instantaneous Companded Audio Multiplex

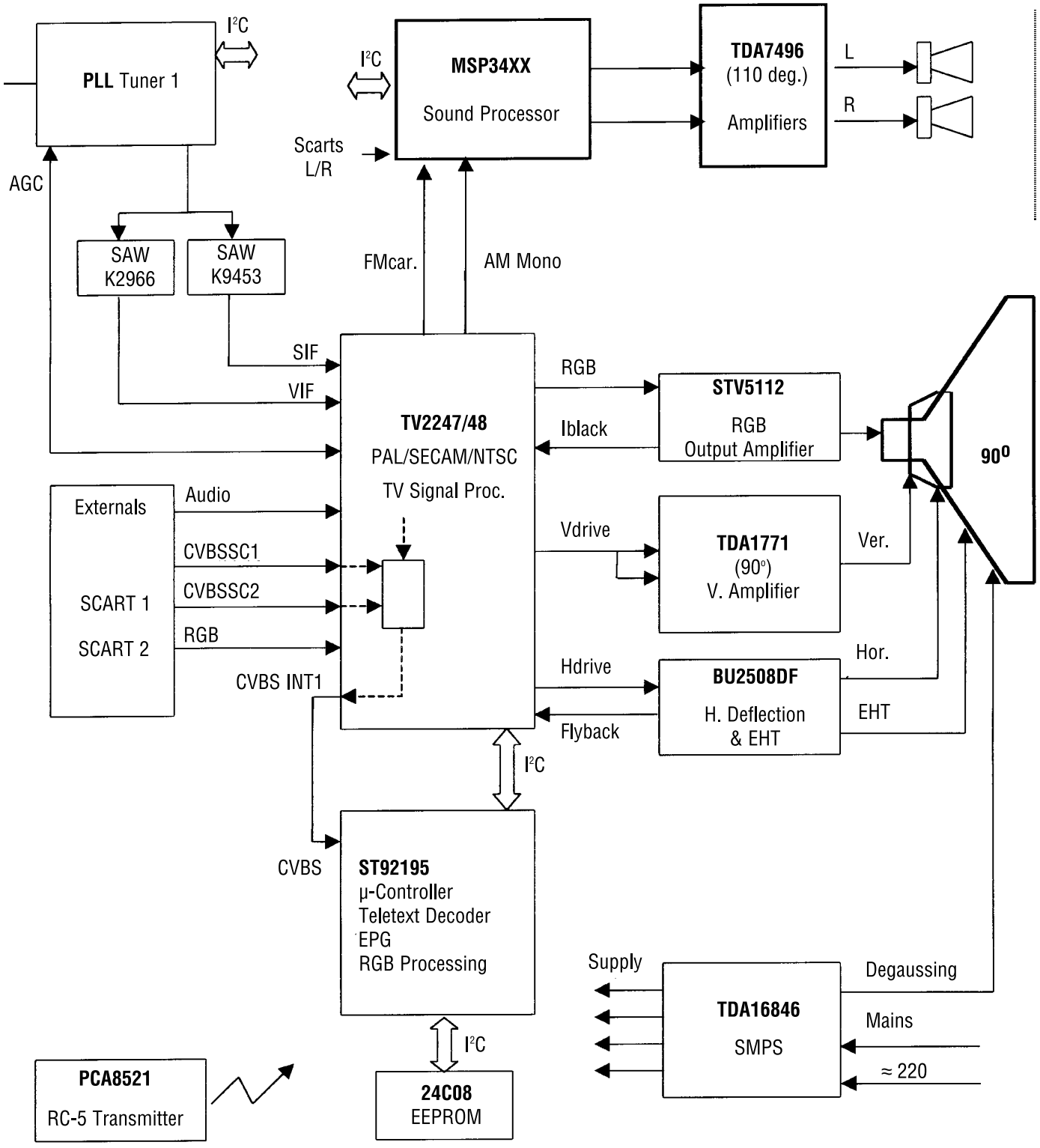
2. Block diagram

Figure 1, 2 and 3 shows the basic block diagram of PT90A.

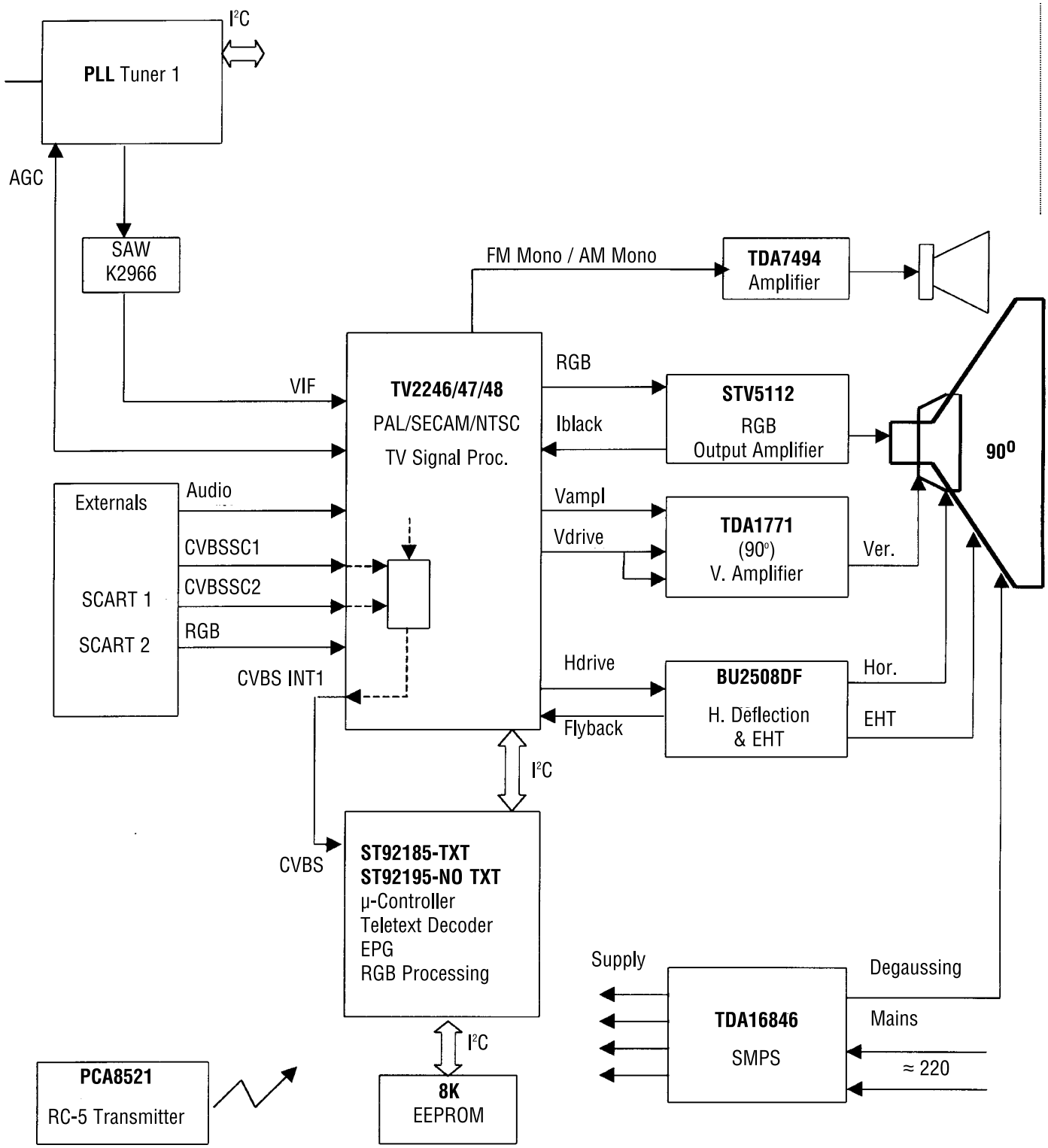
PT90A 110° STEREO CHASSIS



PT90A 90° STEREO CHASSIS



PT90A 90° MONO CHASSIS



Basic Hardware Specification

The following are the components that a PT90A controlled system consists of;

• ST921x5 TV+OSD+(TXT) controller with PT90A software inside 24C08 1024*8 bit NV-Memory (EEPROM) for storage of favourite programmes,

• preffered sound and picture controls, service menu settings.

• STV224x I²C bus controlled multi-standard one-chip TV-processor

• Pre-programmed RC-5 remote control transmitter

• Temic-Alps-Philips-Thomson-Orega PLL Tuners

• 90° Chasis

• TDA 1771 Vertical Deflection IC

• 110° Chasis

• STV9306 I²C bus controlled vertical deflection and E-W correction circuit

For stereo systems the following optional device is supported MSPXX(D/G) German and NICAM stereo sound decoder. Communication between the microcontroller (master) and all related devices (slaves) is carried out by means of the two-wire bidirectional I²C bus. This chapter describes all of the functions and hardware equirements of PT90A. The overall control of the system is handled by the microcontroller which

performs the following;

• Decodes the serial data from the remote controller

• Scans the local keyboard

• Controls the OSD

• Exchanges information via the serial I²C bus

• Selects the proper tuner, tuner band

• Selects the proper IF and the sound demodulator

• Analogue picture controls

• Switches between internal and external audio and video signals

5.1 Interface Description

5.1.1 Remote Control Handset.The remote control handset which is compatible with RC-5 standard.

5.1.2 Remote Control Decoding

The infrared remote control pulses are modulated at the standard RC-5 frequency of 36 KHz. The remote control signal (active HIGH) from the IR-receiver (TFMK1380T) is fed to the external interrupt input (IR-INPUT) of the microcontroller. Finally the video identification in STV224x is checked to make sure that the

search terminated on a video carrier. For SECAM L' (France VHF) channel search starts with the highest

channel frquency and all steps atre carried out in the reverse order. When micro search fails to find a signal in a channel, it will tune the standardised channel frequency.

Sound Systems

PT90A supports stereo sound system as well as mono both controlled via I²C bus from the video processor (Sn/224x).

Mono Sound Sysfem

The only available sound control is volume. In FE-mode, after tuning a programme, the system always selects the sound witta the following priority.

AMSound

If a transmitter is tuned with colour standard SECAM L/L', the sound will be forced to AM.

The AM sound system is automatically forced via the STV224x when positive modulation (SECAM-L or SECAM-L' is selected.

Sfereo Sound Sysfem

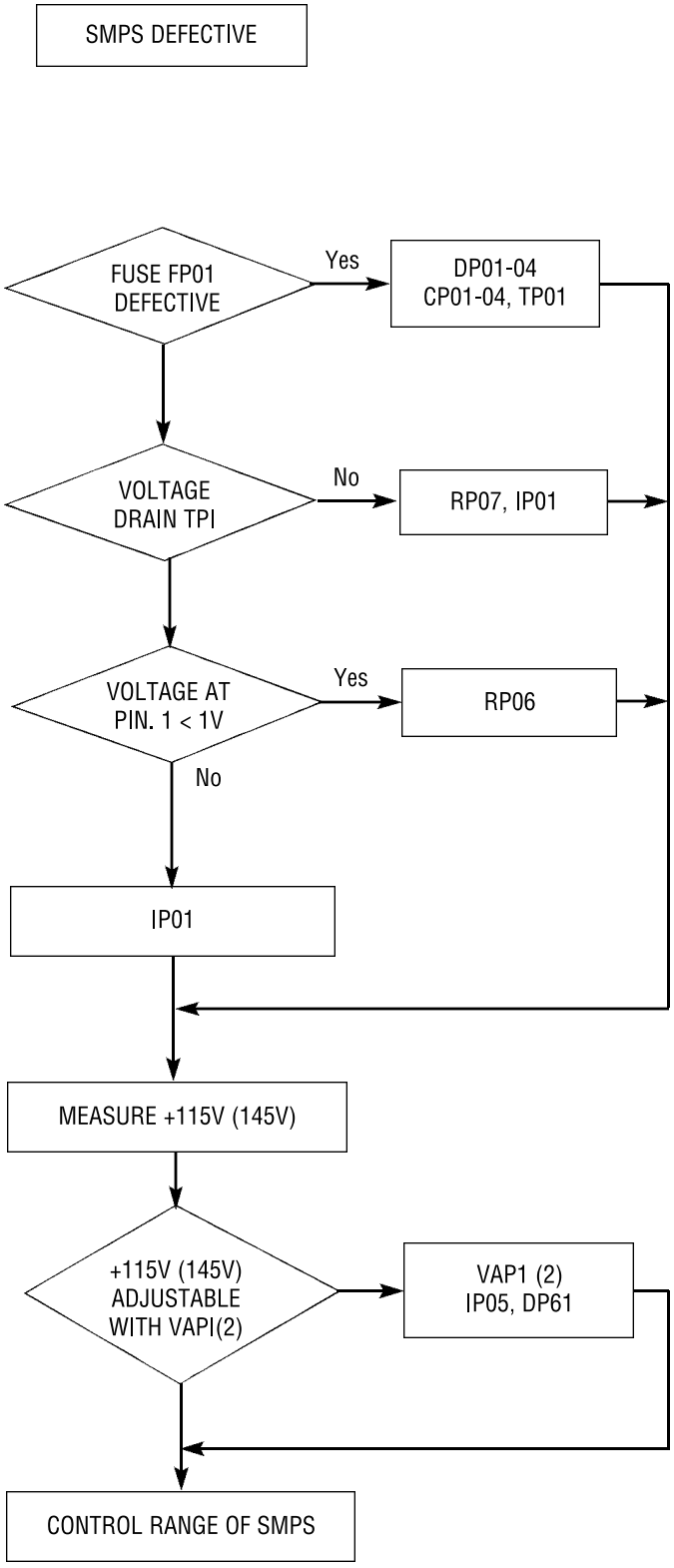
Direct control of the audio functions (on the remote transmitter as individual buttons) are;

personal preference function, volume, mute, mono/stereo/language

Automatic identification and decoding of German Stereo and NICAM sound systems

A. German Stereo (A2):	Mono / Stereo / Dual I / II
B. NICAM Stereo	Mono / Stereo / Dual I / II
C. Mono	Only mono

TROUBLESHOOTING GUIDE FOR SMPS



TROUBLESHOOTING GUIDE FOR MAIN PCB

TROUBLE	CHECK POINTS
No picture	FP01, RP01, DP01-04, TP01, ICV1, ICV2, RD10, RD01, TD02
No sound	DP12, IA01, ICV1, IC01, CA10, CA11, ICM1, X800, R806
Sound distortion	IA01, CA05, ICV2
No color	ICV1, XV01, XV02, CV24
Dark picture	ICV1, ICV2, RV94, screen adj.
Horizontal size	CD03, CD04, CD05, LD01, CD06, ID21, DD22, +115V adj.
Verticable size	ID21, (ID41), CD26, CD44, RD10, RD17, DD07, DD08, RD29, RD50
Horizontal Linearity	LD03, RD14
Verticable linearity	RD49, CD43
Noise picture	TU01, IF adj., AGC adj.
White screen	RD08, ICV2

ST921x5
Microcontroller

Microcontroller + OSD + (Teletext decoder) + VPS/PDC/WSS decoder are embeded in one chip, where there are two types with the major difference;

ST92185 No-teletext

ST92195 With teletext

The ST92195 microcontroller is developed and manufactured by STMicroelectronics using a proprietary n-well HCMOS process. Its performance derives from the use of a flexible 256-register programming model for ultra-fast context switching and real-time event response. The intelligent on-chip peripherals offload the ST9 core from I/O and data management processing tasks allowing critical application tasks to get the maximum use of core resources. The ST92195 MCU supports low power consumption and low voltage operation for power-efficient and low-cost embedded systems.

The advanced ST9+ Core consists of the Central Processing Unit (CPU), the Register File and the Interrupt controller. The general-purpose registers can be used as accumulators, index registers, or address pointers. Adjacent register pairs make up 16-bit registers for addressing or 16-bit processing. Although the ST9 has an 8-bit ALU, the chip handles 16-bit operations, including arithmetic, loads/stores, and memory/register and memory / memory exchanges. Two basic addressable spaces are available: the Memory space and the Register File, which includes the control and status registers of the on-chip peripherals. Power consumption of the device can be reduced by more than 95% (Low power WFI).

Up to 28 I/O lines are dedicated to digital Input / Output. These lines are grouped into up to five I/O Ports and can be configured on a bit basis under software control to provide timing, status signals, timer and output, analogue inputs, external interrupts and serial or parallel I/O. A set of on-chip peripherals form a complete system for TV set and VCR applications:

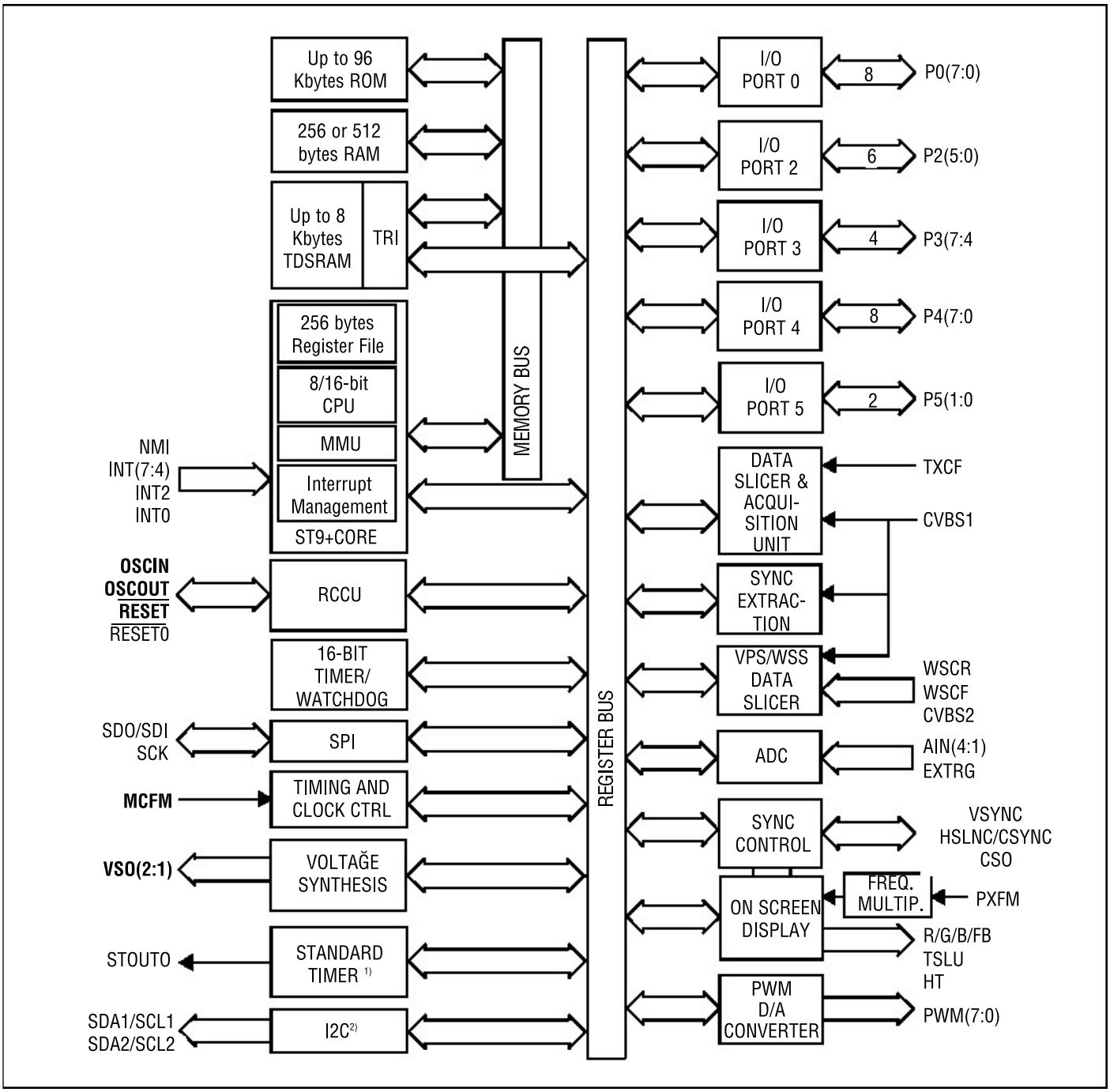
- Voltage Synthesis
- VPS / WSS Slicer
- Teletext Slicer
- Teletext Display RAM
- OSD

Pig. ST921x5 Microcontroller Block diagram

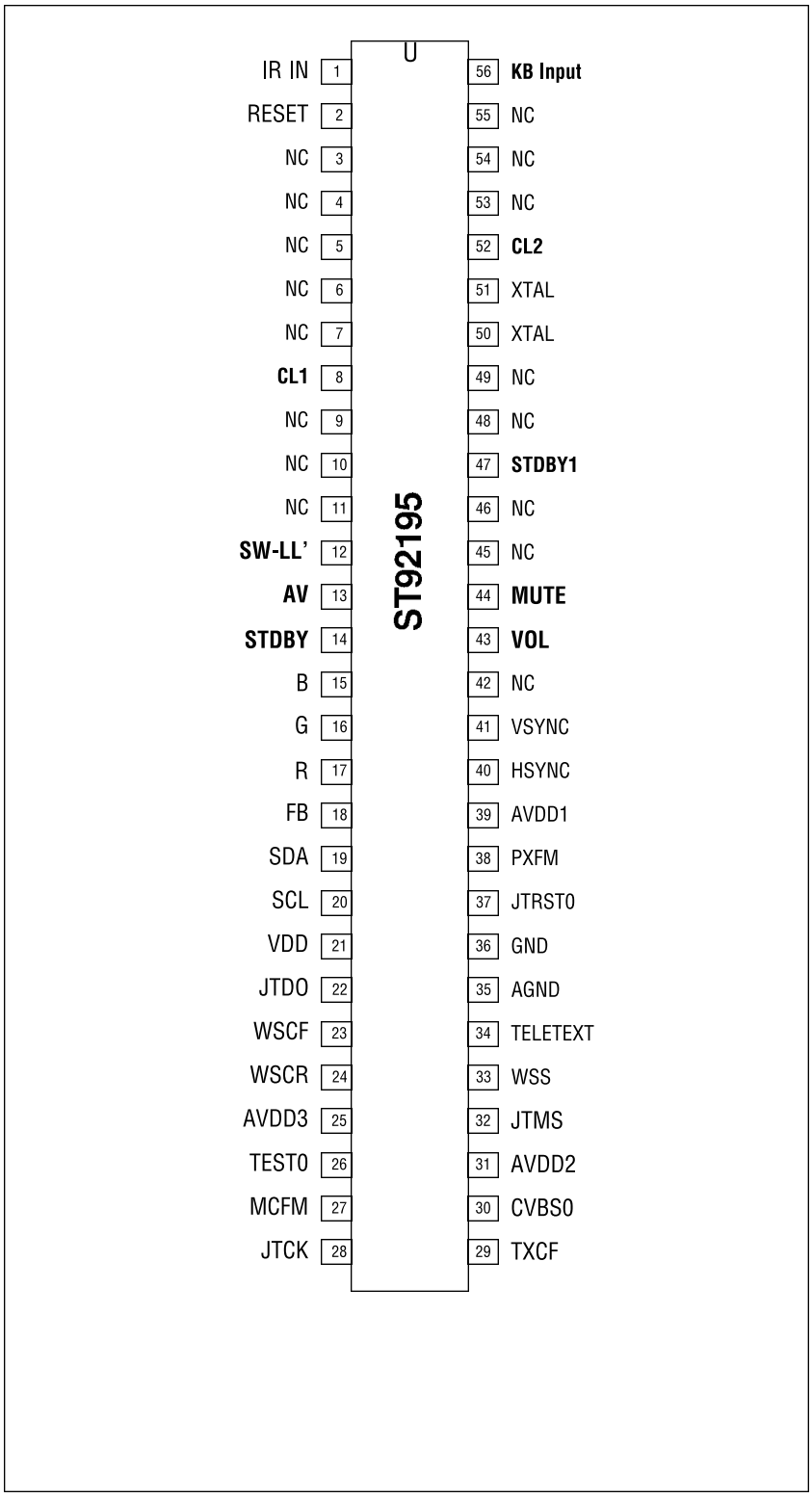
GENERAL FEATURES

- Register File based 8/16 bit Core Architedure with RUN, WFI, SLOW and HALT modes
- 0°C to +700C Operating Temperature Range available
- Up to 24 MHz Operation @ 5V±10%
- Minimum instruction cycle time: 375nS at 16MHz internal clock
- 64K Bytes ROM
- 256 Bytes RAM of Register file (accumulators or index registers)
- 256 Bytes of on-chip static RAM
- 8K Bytes of TDSRAM (Teletext and Display RAM)
- 56-lead Shrink DIP package
- 28 fully programmable I/O pins
- Serial Peripheral Interface
- Flexible Clock controller for OSD, Data Slicer and Core clocks running from one single low frequency external crystal.
- Enhanced Display Controller with 26 rows of 40/80 characters
- Serial and Parallel attributes
- 10x10 dot Matrix, 512 ROM characters, definable by user
- 4/3 and 16/9 supported
- Rounding, fringe, double width, double height, scrolling, cursor, full background colour, semi-transparent mode and reduced intensity colour supported Teletext unit, including Data slicer, Acquisition Unit and up to 8K Bytes
- RAM for Data Storage
- VPS and Wide Screen Signalling slicer
- Integrated Sync Extractor and Sync Controller
- 14-bit Voltage Synthesis for tuning reference voltage
- Up to 6 External Interrupts plus 1 non-maskable interrupt
- 8 x 8-bit programmable PWM outputs with 5V open-drain or push-pull
- Capability
- 16-bit Watchdog timer with 8-bit prescaler
- 16-bit standard timer with 8-bit prescaler usable as a Watchdog timer
- 3-channel Analog-to-Digital converter; 6-bit guaranteed
- Rich instruction set and 14-Addressing modes

Block Diagram



4- Pin description



PINNING

Pin	Symbol	Function
1	P2.0IRIN	IIR Input
2	RESETRESETI	Hardware Reset
3	P0.7NCI/0	Not Used
4	P0.6NCI/0	Not Used
5	P0.5NCI/0	Not Used
6	P0.4NCI0	Not Used
7	P0.3NCI	Not Used
8	P0.2CL1I	SCART 1 status input
9	P0.1NCI/0	Not Used
10	P0.0NCI/0	Not Used
11	P3.7NCI/0	Not Used
12	P3.6SW-LL'OSAW	Filter Switch for L/L'
13	P3.5AV0	Sound switch for two AV source in mono chasis
14	P3.4STDBY0	Standby ON/OFF
15	BB00SD	Blue colour Signal Output
16	GG00SD	Green colour Signal Output
17	RR00SD	Red colour Signal Output
18	BLANKBLANK00SD	Blanking Output
19	P5.1SDAI/0I2C	Data Line
20	P5.0SCL0I2C	Clock line
21	VDDVDD	+5V Digital Supply
22	JTD0JTD0	Test Pin
23	WSCFWSCF	Analog Pin For VPS /WPP slicer line PLL
24	WSCRWSCR	Analog Pin For VPS /WPP slicer line PLL
25	AVDD3AVDD3	+5V Analog VDD For PLL
26	TEST0TEST0	Test pin
27	MCFBMCFB	Analog Pin for VPS/ WSS line PLL
28	JTCKJTCK	Test pin
29	TXCFTXCF	Analog Pin for VPS/ WSS line PLL
30	CVBS0CVBS0	Test pin
31	AVDD2AVDD2	Analog Power Supply
32	JTMSJTMS	Test pin
33	CVBS2CVBS2ICVBS	In for VPS/WSS
34	CVBS1CVBS1ICVBS	In for Teletext Slicer
35	AGNDAGND	Analog Ground
36	GNDGND	Digital Ground
37	JTRST0JTRST0	Test pin
38	PXFMPXFM	Analog pin for display pixel freq. multiplier
39	AVDD1AVDD1	Analog Power Supply
40	HSYNCHSYNCI	Horizontal Sync Input

PINNING

Pin	Symbol	Function
41	VSYNCVSYNCI	Vertical Sync Input
42	P4.0NCI/O	Band Switch 1
43	P4.1VOLOPWM	Gain Control for Audio amp.
44	P4.2MUTE0	Mute output pin
45	P4.3NCI/O	Not Connected
46	P4.4NCI/O	Not Connected
47	P4.5STDBY10	Eco Switch Control
48	P4.6NCI/0	Not Connected
49	P4.7NCI/0	Not Connected
50	XTALXTAL	Clock Oscillator
51	XTALXTAL	Clock Oscillator
52	P2.5CL2ISCART2	Status Input
53	P2.4NCI/OLED	Output Pin
54	P2.3NCI/O	Not Connected
55	P2.2NCI/O	Not Connected
56	P2.1KBInputI	Key Board Input

RESET

Reset input is an active-low one. ST921x5 is initialized by the RESET signal.

When the RESET deactivated, programme execution starts from the 00H and 01H addressed programme memory locations.

R/G/B/BLANK

The video colour analogue DAC outputs are Red / Green / Blue / Fast Blanking.

XTAL

These pins are used to connect parallel resonant crystals of 4 MHz

AV Status

Logic Level Control (High or Low)

Pin 8 and Pin 52 monitor the status of the AV SCART connectors. The controller detects the transitions at these pins. When the signal goes from high to low, the TV set will automatically switch to AV mode. The signal going from low to high will lead the TV set to go back to the previous source. Voltage Level Control (O...12V)

Voltage measurement values are taken from these pins. 4:3 or 16:9 picture ratio from SCART or TV mode selection is dependent on the voltage values at these pins. User control always has a priority in both TV and

AV mode. Following the change of source or the channel, 4:3 format is assumed by default. The voltage values stated below are divided by 3 at the microcontroller pins.

AV Status (Pin 8)Picture Ratio

- 0 - 2.0 VTV Mode
- 2.0 - 4.5V No change
- 4.5 - 7.0V 16:9 Scart
- 7.0 - 9.0V No change
- 9.0 - 12.0V 4:3 Scart

Keyboard Scan Lines

The 4 keys of the local keyboard are scanned by an ADC used by the microcontroller.

Table Local Keyboard

Name CodeTV ModeTXT Sub mode

- Volume Down0Volume -Volume -
- Volume Up1Volume +Volume +
- Programme Down2Programme -Page -
- Programme Down3Programme +Page +

Power Mode Control

The STDBY (pin 14) output specifies the mode which the set is in; Stand-by mode or Operating mode.

Table Power Modes:

ST-BYMode

- 1-Stand-by
- 0-Operating

I^2C Lines

Pin 20 (SCL) and Pin 19 (SDA) accept inputs from the I^2C bus. I^2C is a 2-wire bi-directional bus. PT90A has an on-chip bit-level I^2C interface. This means the bus arbitration, the reception and transmission of data bits and the generation of START and STOP are manipulated by the hardware. The software must be able to handle these bits (i.e. save a received bit and prepare the bits to be transmitted). If a transmission does not succeed, the software will retry for 5 times. If the bus is occupied for more than 1.18 ms. the microcontroller will attempt to free the bus. PT90A supports a 1K EEPROM (M24C08-BN6), used for storage of analogue controls, tuning data for 100 pre-selected programmes and options. The I^2C addresses of the EEPROM is described in the following chapters. Furthermore the video-processor STV224x is controlled via I^2C bus on address 8AH.

24C08
Non-Volatile Memory

These I²C-compatible electrically erasable programmable memory (EEPROM) is organized as 1024 x 8 bit and operate with a power supply of 5 V. The memory behaves as a slave device in the I²C protocol, with all memory operations synchronized by the serial clock. Read and Write operations are initiated by a START condition, generated by the bus master. The START condition is followed by a Device Select Code and RW bit terminated by an acknowledg bit.

Table 6. DC Characteristics

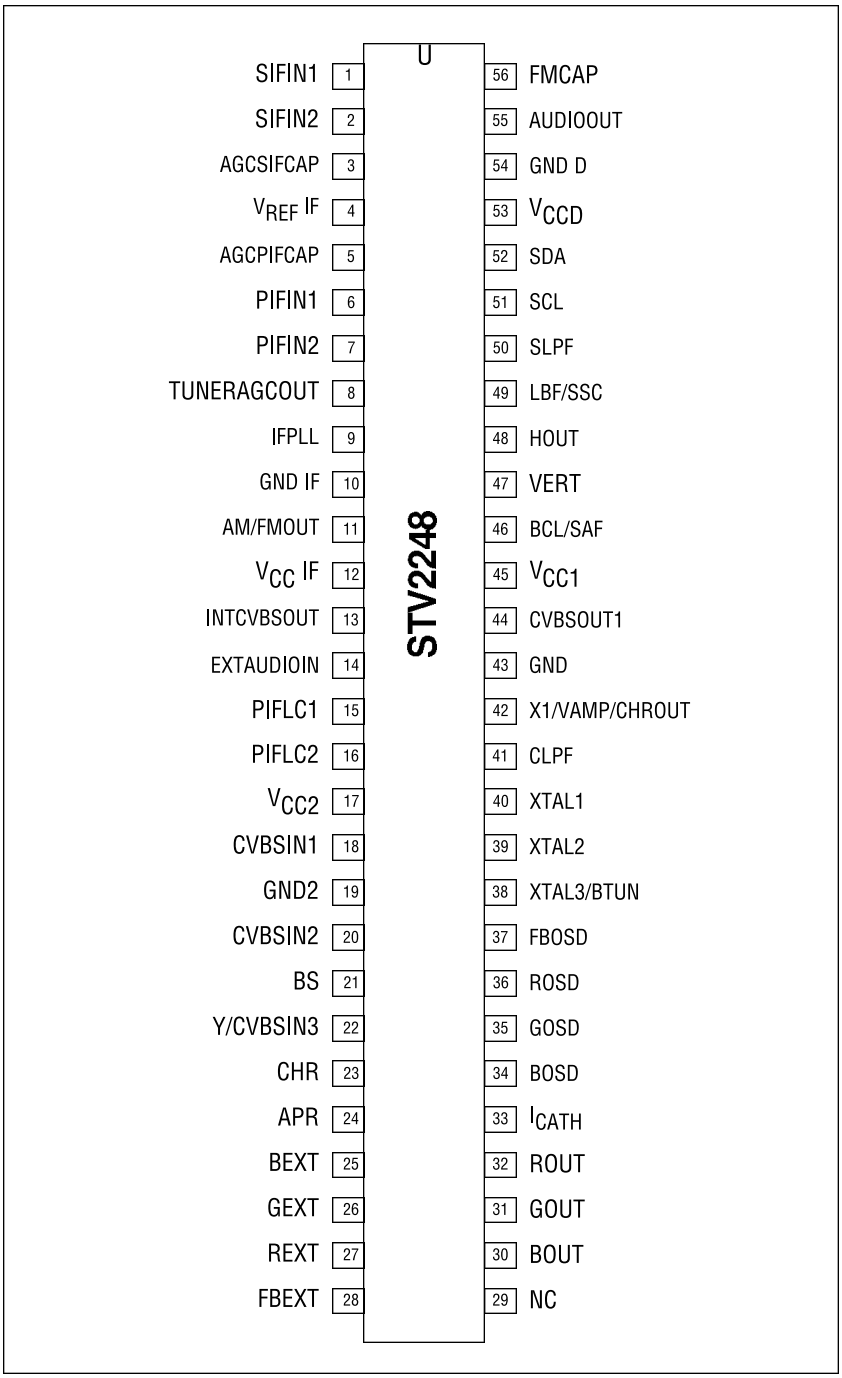
(T_A= 0 to 70°C, -20 to 85°C or - 40 to 85°C; Vcc = 3V to 5.5V, 2.5V to 5.5V or 1.8V to 5.5V)

Symbol	Parameter	Test Condition	Min.	Max.	Unit
I_{LI}	Input Leakage Current	$0V \le V_{IN} \le V_{CC}$	-	±2	µA
I_{LO}	Output Leakage Current	$0V \le V_{OUT} \le V_{CC}$ SDA in Hi-Z	-	±2	µA
I_{CC}	Supply Current (ST24 series)	V_{CC} = 5V, fc= 100kHz (Rise/Fall time < 10ns)		2	mA
	Supply Current (ST25 series)	V_{CC} = 2.5V, fc= 100kHz		1	mA
I_{CC1}	Supply Current (Standby) (ST24 series)	$V_{IN} = V_{SS}$ or V_{CC} VCC = 5V		100	µA
		$V_{IN} = V_{SS}$ or V_{CC} V_{CC} = 5V, fc= 100kHz		300	µA
I_{CC2}	Supply Current (Standby) (ST25 series)	$V_{IN} = V_{SS}$ or V_{CC} VCC = 2.5V		5	µA
		$V_{IN} = V_{SS}$ or V_{CC} V_{CC} = 2.5V, fc= 100kHz		50	µA
I_{CC3}	Supply Current (Standby) (ST24C08R)	$V_{IN} = V_{SS}$ or V_{CC} VCC = 3.6V		20	µA
		$V_{IN} = V_{SS}$ or V_{CC} V_{CC} = 3.6V, fc= 100kHz		60	µA
I_{CC4}	Supply Current (Standby) (ST24C08R)	$V_{IN} = V_{SS}$ or V_{CC} VCC = 1.8V		10	µA
		$V_{IN} = V_{SS}$ or V_{CC} V_{CC} =1.8V, fc= 100kHz		20	µA
V_{IL}	Input Low Woltage (SCL, SDA)		-0.3	$0.3V_{CC}$	V
V_{IH}	Input High Woltage (SCL, SDA)		$-0.7V_{CC}$	V_{CC} +1	V
V_{IL}	Input Low Woltage (E,PRE,MODE,$\overline{WC}$)		-0.3	0.5	V
V_{IH}	Input High Woltage (E,PRE,MODE,$\overline{WC}$)		V_{CC}-0.5	V_{CC} +1	V
VOL	Output Low Voltage (ST24 series)	I_{CL} = 3mA, V_{cc} = 5V		0.4	V
	Output Low Voltage (ST25 series)	I_{CL} = 2.1mA, V_{cc} = 2.5V		0.4	V
	Output Low Voltage (ST24C08 series)	I_{CL} = 1mA, V_{cc} = 1.8V		0.3	V

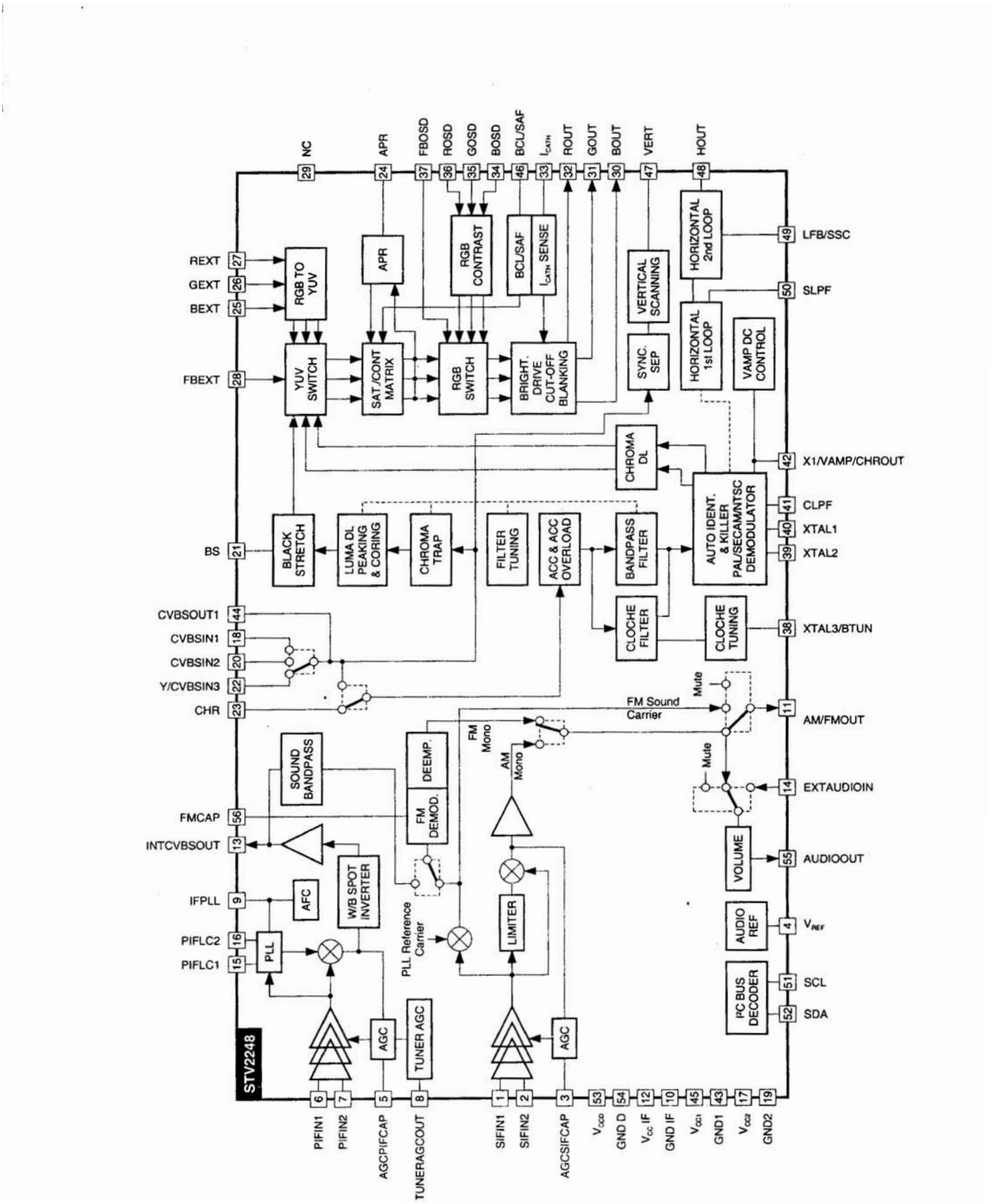
STV224X
Multistandard TV Processor

STV224X is a fully bus controlled IC for n/ including PIF, SIF, Luminance, Chrominance and deflection processing. It is a bus controlled PAL / SECAM / NTSC single chip TV Processor. For details of STV224X features please refer to the STV224X datasheet. 110°, 4:3 or 16:9 CRT application. It integrates both vertical deflection and E-W correction circuit necessary for design of 110° chassis it allows designing a PAL / NTSC (BGDKIMN) set with very few external componentsand no manual adjustment.

Pin connections



Pin	Symbol	Function
1	SIFIN1	SIF Input
2	SIFIN2	SIF Input
3	AGCSIFCAP	AGC SIF Capacitor
4	VREF IF	Voltage Reference Filtering
5	AGCPIFCAP	AGC PIF Capacitor
6	PIFIN1	PIF Input
7	PIFIN2	PIF Input
8	TUNERAGCOUT	AGC Tuner Output
9	IFPLL	IF PLL Filter
10	GND IF	IF Ground
11	AM/FMOUT	AM/FM Mono Sound or Stereo Carriers Output
12	V_{CC} IF	5V IF Supply
13	INTCVBSOUT	Internal CVBS Output
14	EXTAUDIOIN	Audio scart Input
15	PIFLC1	LC Input
16	PIFLC2	LC Input
17	V_{CC2}	Video/Luma Supply Voltage (8V)
18	CVBSIN1	Internal Video Input
19	GND2	Video/luma Ground
20	CVBSIN2	External Video Input
21	BS	Black Stretch Capacitor
22	Y/CVBSIN3	Y(SVHS) or CVBS3 External Input
23	CHR	Chroma (SVHS) input
29	APR	Auto Peak Regulation
25	BEXT	External Blue Input
26	GEXT	External Green Input
27	REXT	External Red Input
28	FBEXT	External Fast Blanking Input
29	NC	Not to be connected
30	BOUT	Blue Output
31	GOUT	Green Output
32	ROUT	Red Output
33	I_{CATH}	Cathode Current Measurement Input
34	BOSD	OSD Blue Input
35	GOSD	OSD Green Input
36	ROSD	OSD Red Input
37	FBOSD	OSD Fast Blanking
38	XTAL3/BTUN	3.5XMHz Crystal or Cloche Filter Tuning Capacitor
39	XTAL2	3.5XMHz Crystal
40	XTAL 1	4.43/3.5XMHz Crystal
41	CLPF	Chroma PLL Filter
42	X1/VAM/CHROUT	XTAL1 Control Pin Vertical Amplitude DAC Output and Chroma Reference Signal Output
43	GND 1	Chroma/Scanning Ground
44	CVBSOUT 1	Main Video Switch Output
45	V_{CC1}	Chroma/Scanning Power Supply (8V)
46	BCL/SAF	Beam Current Limiter Control Voltage and Safety input (XRAY)
47	VERT	Vertical Output Pulse
48	HOUT	Horizontal Output Pulse
49	LFB/SSC	Line Flyback Input and Super-sandcastle Output
50	SLPF	Scanning PLL Filter
51	SCL	I^2C Bus Clock Input
52	SDA	I^2C Bus Data Input
53	V_{CCD}	Digital Supply Voltage (5V)
54	GND D	Digital Ground
55	AUDIOOUT	Main Audio Output
56	FMCAP	FM Demodulation Capacitor


NC
APR
FBOSD
ROSD
GOSD
BOSD
BCL/SAF
ROUT
GOUT
BOUT
VERT
HOUT
REXT
GEXT
BEXT
FBEXT
RGB TO YUV
YUV SWITCH
APR
SAT./CONT MATRIX
RGB CONTRAST
RGB SWITCH
BCL/SAF
SENSE
BRIGHT. DRIVE CUT-OFF BLANKING
VERTICAL SCANNING
SYNC. SEP
HORIZONTAL 2nd LOOP
HORIZONTAL 1st LOOP
VAMP DC CONTROL
LFB/SSC
SLPF
CHROMA DL
X1/VAMP/CHROUT
BS
BLACK STRETCH
LUMA DL PEAKING & CORING
CHROMA TRAP
FILTER TUNING
ACC & ACC OVERLOAD
BANDPASS FILTER
AUTO IDENT. & KILLER PAL/SECAM/NTSC DEMODULATOR
CLPF
XTAL1
XTAL2
CLOCHE FILTER
CLOCHE TUNING
XTAL3/BTUN
CVBSOUT1
CVBSIN1
CVBSIN2
Y/CVBSIN3
CHR
FM Sound Carrier
Mute
AM/FMOUT
SOUND BANDPASS
DEEMP.
FM DEMOD.
FM Mono
AM Mono
EXTAUDIOIN
FMCAP
INTCVBSOUT
W/B SPOT INVERTER
VOLUME
AUDIOOUT
IFPLL
AFC
PIFLC2
PIFLC1
PLL
PLL Reference Carrier
LIMITER
AUDIO REF
V_{REF}
I²C BUS DECODER
SCL
SDA
STV2248
AGC
TUNER AGC
PIFIN1
PIFIN2
AGCPIFCAP
TUNERAGCOUT
SIFIN1
SIFIN2
AGCSIFCAP
V_{CC0}
GND D
V_{CC} IF
GND IF
V_{CC1}
GND1
V_{CC2}
GND2

MAIN FEATURES

- I^2C bus control (readI and write modes),
- PIF PLL demodulator, Bus controlled VCO alignment,
- IF positive and negative modulation,
- Digital AFC,
- Tuner delayed AGC output,
- White and Black spot cancellation,
- SIF with QSS or intercarrier structure,
- Built in sound bandpass,
- Multistandard PLL FM demodulator (4.5, 5.5, 6.0,6.5MHz),
- AM demodulator for France,
- FM sound carriers output for Stereo chassis,
- Audio switch for external audio input, Mono chassis,
- Digital volume control,
- Audio Mute,
- Video switch, 3 CVBS inputs, 1 CVBS output which can be used to drive teletext decoder,
- SVHS switch, Y input is combined with CVBS3 input,
- OSD RGB analog inputs, fast blanking detection on OSD fast blanking pin, contrast control capability, oversize blanking capability on OSD fast blanking input,
- External analog RGB inputs with contrast and saturation control (external RGB matrixed in YUV).
- Integrated chroma filters (trap, bandpass, cloche) with automatic alignment,
- Integrated luminance delay line,
- Adjustable peaking on the luminance signal with coring function,
- Black strech circuit,
- PAL / SECAM / NTSC color decoder with automatic identification of standards,
- Integrated chroma delay line,
- Full integrated SECAM decoder,
- Hue control, two selectable matrixes in NTSC mode,
- Automatic flesh control circuit with two selectable characteristics (normal and wide),
- ACC overload circuit,
- Chroma subcarrier output which could be used to drive comb filter circuit,
- Automatic RGB peak regulation (APR).
- Automatic digital cut-off current loop with warm-up detection circuit,
- White point and cut-off point adjustments,
- Beam current limiter control stage,
- High performance synchronization pulses separator,
- Horizontal synchronization with two phase locked loops,
- Integrated VCO, auto-calibration using the chroma crystal reference frequency,
- Automatic time constant selection for the first PLL, 3 selectable time contants,
- Video identification circuit (independant from PLL1),
- Noise detector circuity
- Vertical countdown circuit,
- Automatic 50/60Hz selection circuit,
- Blanking and inserted cut-off pulses position adapted to standard (50 or 60Hz),
- Long blanking mode capability in 60Hz (same blanking as 50Hz standard),
- Possibility to insert cut-off pulses after a vertical oversize blanking signal,
- De-interlace capability,
- Horizontal starting circuit with soft-start capability,
- Horizontal and vertical position adjustments, vertical amplitude control voltage (combined with chroma subcarrier output),
- 4/3, 16/9 selection voltage.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC} 8V	8V supply voltage	10	V
V_{CC} 5V	5V supply voltage	7	V
VESD	Capacitor 100pF discharged via 1.5kΩ serial resistance (Human Body Model)	±2	kV
Toper	Operating Temperature	0,+70	°C
Tstg	Storage Temperature	-55 +150	°C

THERMAL DATA

Symbol	Parameter	Typical Value	Unit
Rth(j-a)	Junction ambient Thermal Resistance (Measured at P_D= 1W) SDIP56	40	°C/W

ELECTRICAL CHARACTERISTICS

Supplies at Typical Values, Tamb =25 °C, I²C bus register at power-on reset value. unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
SUPPLY						
V_{CCIF}	IF Circuit Supply Voltage		4.75	5	5.25	V
V_{CCD}	Bus & Digital Supply Voltage		4.75	5	5.25	V
V_{CC1}	Chroma, Scanning Supply Voltage		7.6	8	8.4	V
V_{CC2}	Video Supply Voltage		7.6	8	8.4	V
I_{CCF}	V_{CCIF} Current Consumtion	V_{CCIF} = 5V		TBD		mA
I_{CC5V}	V_{CC5V} Current Consumtion	V_{CCD} = 5V		TBD		mA
I_{CC1}	V_{CC1} Current Consumtion	V_{CC1} = 8V		TBD		mA
I_{CC2}	V_{CC2} Current Consumtion	V_{CC2} = 8V		TBD		mA
P_D	Total Power Dissipation	V_{CC1} = V_{CC2} =8V, V_{CCIF} = V_{CC5V} = 5V		TBD		mW

MSP34XX (D/G)
Multistandard Sound Processor

The MSP34xx (D/G) family of single-chip Multistandard Sound Processors covers the sound processing of all analog TV-Standards worldwide, as well as the NICAM digital sound standards. The full TV sound processing, starting with analog sound IF signal-in, down to processed analog AF-out, is performed on a single chip. It covers all European TV-Standards The MSP 3400 1.0 m CMOS version is fully pin and soft-ware compatible to the MSP 3410, but is not able to de-code NICAM. It is also compatible to the MSP 3400C 0.8 m CMOS version.

The IC is produced in submicron CMOS technology, combined with high performance digital signal processing.

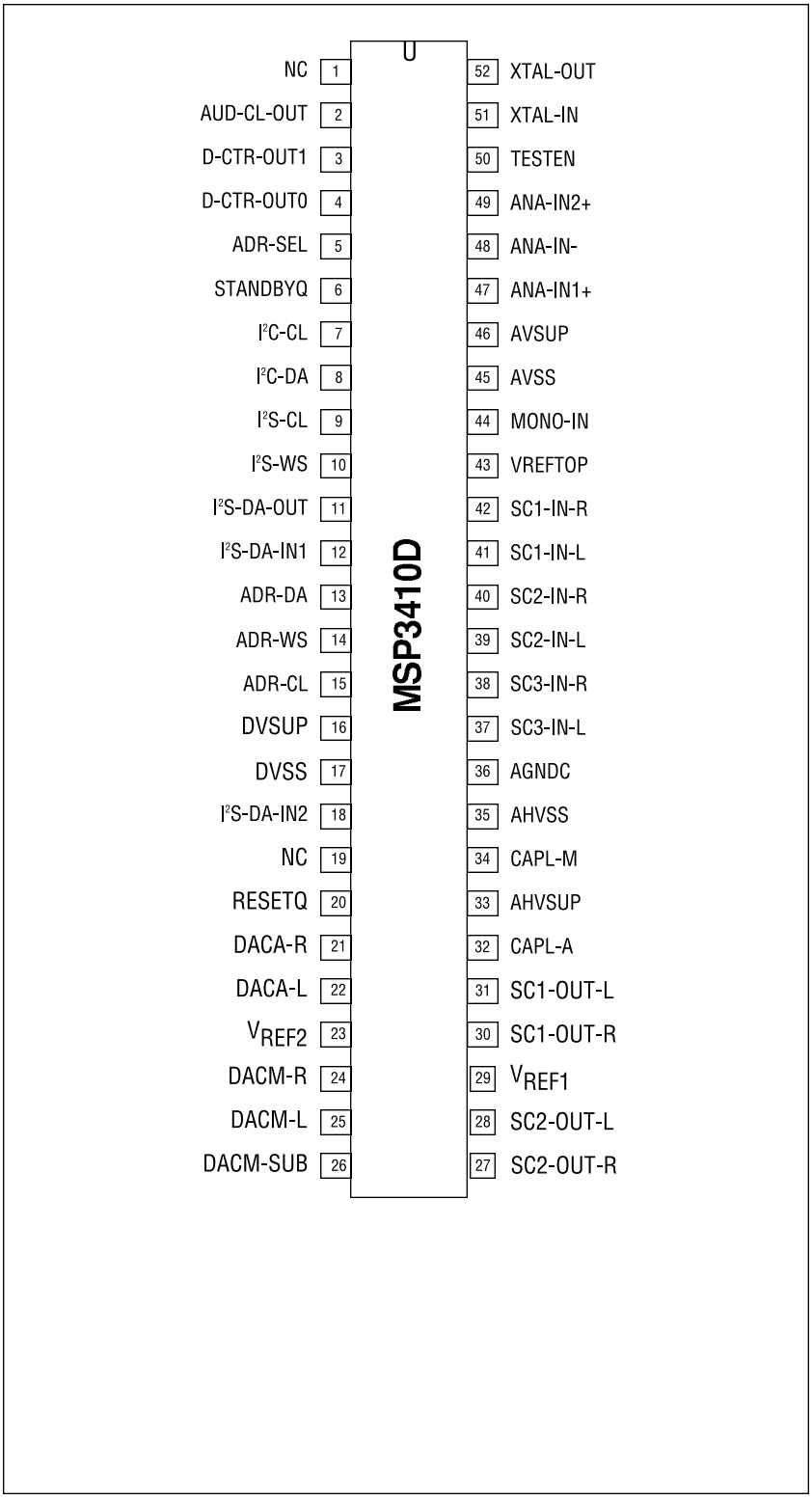
The MSP 3410D is available in a PLCC68, PSDIP64, PSDIP52, and in a PQFP80 package.

Note: The MSP3410D version is fully downward compatible to the MSP 3410B, the MSP 3400B, and the MSP3400C. To achieve full software compatibility with MSP3400C, MSP 3400B, and MSP 3410B, the demodulator part must be programmed as described in the data sheet of MSP 3410B.

MSP 3410D Additional Features

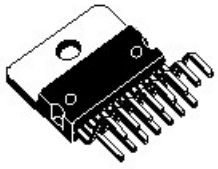
- AVC: Automatic Volume Correction
- Subwoofer Output
- 5-band graphic equalizer (as in MSP 3400C)
- Enhanced spatial effect (pseudostereo/basewidth en-largement as in MSP 3400C)
- Headphone channel with balance, bass, treble, loud-ness
- Balance for loudspeaker and headphone channels in dB units (optional)
- Additional parr of D/A converters for SCART2 out
- Improved oversampling filters (as In MSP 3400C)
- Additional SCART input
- Full SCART In/out matrix without restrictions
- Scart volume in dB units (optional)
- Additional I2S input (as in MSP 3400C)
- New FM-identification (as in MSP 3400C)
- Demodulator- short programming
- Autodetection for- terrestrial TV-sound standards
- Precise bit-error rate indication
- Automatic switching from NICAM to FM/AM or vice versa
- Improved NICAM synchronization algorithm
- Tmproved carrier mute algorithm
- Improved AM-demodulation
- ADR together- with DRP 3510A
- Dolby Pro Logic together with DPL 35xx A
- Reduction of necessary controlling
- Less external components
- Significant reduction of radiation

Pin description



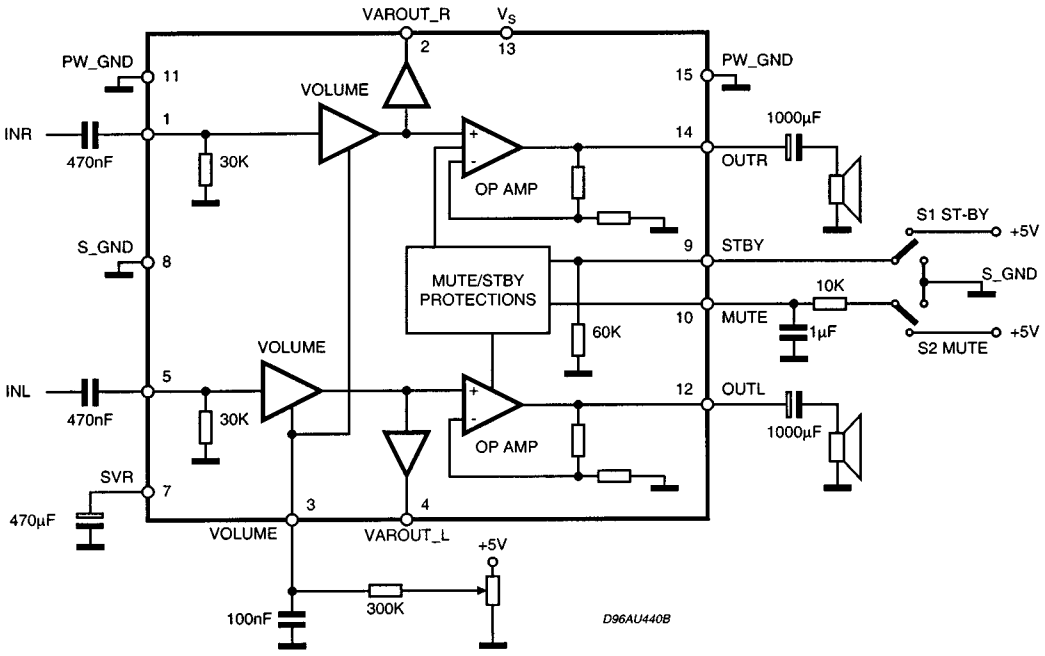
TDA7495
11+11W Amplifier With DC Volume Control

- 11+11W Output Power
- RL = 8Ω @THD = 10% VCC = 28V
- ST-BY and mute functions
- Low turn-on turn-off pop noise
- Linear volume control DC coupled
- With Power Op. Amp.
- No Boucherot Cell
- No ST-BY RC input network
- Single supply ranging up to 35V
- Short circuit protection
- Thermal Overload protection
- Internally fixed gain
- Soft Clipping
- Variable output after volume control
- Circuit multiwatt 15 package



Multiwatt 15
ORDERING NUMBER: TDA7495

Block and Application Diagram

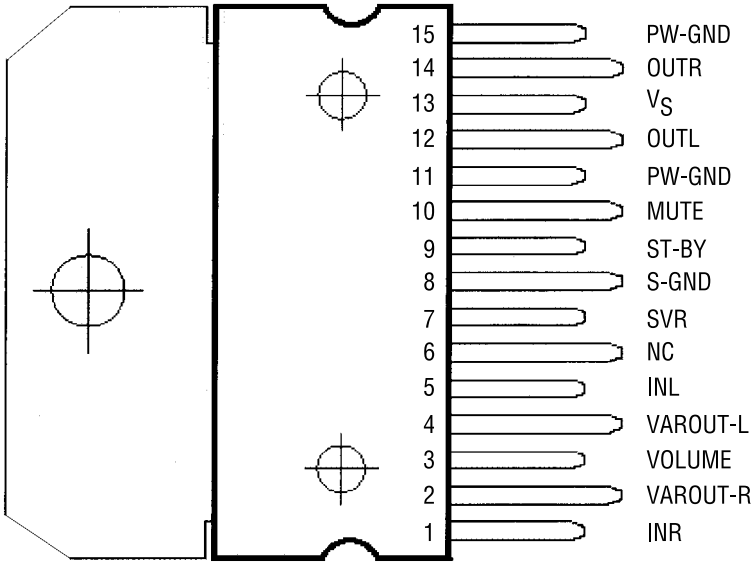


ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_S	DC Supply Voltage	35	V
V_{IN}	Maximum Input Voltage	8	Vpp
P_{tot}	Total Power Dissipation (Tamb = 70 °C)	20	W
Tamb	Ambient Operating Temperature (1)	-20 to 85	°C
Tstg, Tj	Storage and Junction Temperature	-40 to 150	°C
V_3	Volume CTRL DC voltage	7	V

(1) Operation between -20 to 85 °C guaranteed by correlation with 0 to 70 °C

PIN CONNECTION (Top view)



THERMAL DATA

Symbol	Parameter		Value	Unit
Rth j-case	Thermal Resistance Junction - case		Typ. = 2 Max. = 2.8	°C/W
Rth j-amb	Thermal Resistance Junction - ambient	max.	35	°C/W

ELECTRICAL CHARACTERISTICS

(Refer to the test circuit V_S = 20V R_L = 8Ω, R_g = 50Ω, T_{amb} =25°C

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_S	Supply Voltage Range		11		35	V
I_q	Total Quiescent Current			70	100	mA
DCV_{OS}	Output DC Offset Referred to SVR Potential	No Input Signal	-650		650	mV
V_O	Quiescent Output Voltage			10		V
P_O	Output Power	THD = 10%; R_L = 8Ω; V_S = 28V	9.5	11		W
		THD = 1%; R_L = 8Ω; V_S = 28V	7.5	8		W
		THD = 10%; R_L = 4Ω; V_{CC} = 20V	7	8		W
		THD = 1%; R_L = 4Ω; V_{CC} = 20V	5	6		W
		THD = 10%; R_L = 8Ω; V_{CC} = 18V	3.5	3.8		W
		THD = 1%; R_L = 8Ω; V_{CC} = 18V	2.6	2.9		W

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
THD	Total Harmonic Distortion	Gv=30dB; Po=1W; f=1KHz			0.4	%
Ipeak	Output Peak Current	(internally limited)	1.7	2.4		A
Vin	Input Signal				2.8	Vrms
Gv	Closed Loop Gain	Vol Ctrl > 4.5V	28.5	30	31.5	dB
GvLine	Monitor Out Gain	Vol Ctrl > 4.5V; Zload > 30KΩ	-1.5	0	1.5	dB
AMin Vol	Attenuation at Minimum Volume	Vol Ctrl < 0.5V	80			dB
BW				0.6		MHz
e_N	Total Output Noise	f=20Hz to 22KHz Play, max volume		500	800	µV
		f=20Hz to 22KHz Play, max attenuation		100	250	µV
		f=20Hz to 22KHz Mute		60	150	µV
SR	Slew Rate		5	8		V/µs
Ri	Input Resistance		22.5	30		KΩ
RVar Out	Variable Output Resistance			30	100	Ω
RIoad Var Out	Variable Output Load		2			KΩ
SVR	Supply Voltage Rejection	f=1kHz; max volume CSVR=470µF; VRIP=1Vrms	35	39		dB
		f=1kHz; max attenuation CSVR=470µF; VRIP=1Vrms	55	65		dB
TM	Thermal Muting			150		°C
TS	Thermal Shut-down			160		°C
MUTE STAND-BY & INPUT SELECTION FUNCTIONS						
VST-BY	Stand-by threshold		2.3	2.5	2.7	V
VMUTE	Mute threshold		2.3	2.5	2.7	V
IqST-BY	Quiescent Curren @ Stand-by			0.6	1	mA
AMUTE	Mute Attenuation		50	65		dB
IstbyBIAS	Stand-by bias current	Stand-by on VST-BY=5V VMUTE=5V		80		µA µA
		Play or Mute	-20	-5		µA
ImuteBIAS	Mute bias current	Mute		1	5	µA
		Play		0.2	2	µA